Distr.
GENERAL

UNCTAD/COM/54
7 June 1995

ENGLISH ONLY

UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

MARKET SITUATION AND OUTLOOK FOR TIN, 1994

Report by the UNCTAD secretariat

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GE.95-51997

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INTRODUCTION AND SUMMARY

1. This report provides an overview of changes in the tin market and industry since the 1985 tin crisis, particularly during the period 1990 to 1993, along with some indications concerning the situation in 1994 and the outlook for 1995.

2. The 1980s witnessed a major restructuring of the world tin industry. The collapse of the international tin market in October 1985, which led to the demise of the International Tin Council (I.T.C.) had the effect of precipitating and increasing the scope of the restructuring process. The closure of the higher cost tin mines around the world allowed a greater rationalization and consolidation of the world tin industry. The emergence of major new suppliers to the world tin market, in particular Brazil and China and, more recently, significant suppliers such as Peru, Portugal and Viet Nam, has led to a reduction in the importance of traditional producers such as Bolivia, in Latin America, and Malaysia and Thailand, in South-East Asia.

3. Since 1985, the international tin market has been characterized by relatively high instability. After a period of depressed prices and a marked drop in world supplies, a stronger world economy in 1988 and 1989 spurred a recovery in world tin demand, especially in the industrial countries. The reintroduction of tin trading on the London Metal Exchange (L.M.E.) also helped push the price of tin to significant high levels in mid-1989. However, the increase was short-lived, as it was soon followed by a steady decline in tin prices after July 1989 until early 1992. World tin mine output declined as continued low tin prices led to numerous mines closures. Demand for tin also declined as a result of economic problems in the industrialized countries and political and economic problems in the former Soviet Union. Another reason for the decline in demand for tin was the collapse in the price of aluminium during that period, which brought a number of can manufacturers to revert back to this alternative material since tinplate's price advantage over aluminium coil was eroded. In 1992, particularly in mid-year, a modest price improvement took place, mostly prompted by some supply-side disruptions and speculative interest rather than by increases in physical consumption. As demand remained poor, prices resumed their downward trend in the first part of 1993 and reached an all-time low of US$ 4,375 a ton on 4 October 1993, on the LME market.

4. The world economic recovery of 1994 led to a tin price recovery, albeit relatively timid. The fact that China formally joined the Association of Tin Producing Countries (ATPC) in April 1994, and the structural decline in the world tin mining industry should ensure that there would be no further increase in inventories in 1995. On the opposite side, the relatively high level of stocks and the diminishing market shares of tin in its leading applications do not augur well for strenght the near future. On balance, however, prices may be expected to hold, with some possibilities for increase when the economic recovery intensifies in Europe and Japan and its effects spread to developing countries.

I. DEMAND

A. Long-term trends

(a) Overall developments

5. World consumption of tin metal (primary and secondary) has been characterized by a relative stagnation between the end of the 1950s and the middle of the 1980s, and has varied between 200 and 220 thousand tons annually. The period of depressed prices which followed the collapse of the International Tin Agreement in October 1985, together with the economic expansion of the late 1980s pushed consumption to record levels: above 250 thousand tons in both 1989 and 1990. However, this improvement was short-lived; the economic recession of the early 1990s brought the volume of world consumption in 1992-1993 back to almost the levels of 1979-1981, at around 222-225 thousand tons per year. By comparison, between the end of the 1950s and 1993, world consumption increased for aluminium from 4.1 to 26.0 million tons, for copper from 4.8 to 10.8 million tons, for zinc from 3.3 to 6.6 million tons, for lead from 3.1 to 5.2 million tons, and for nickel from 292 to 800 thousand tons.

(b) Changes in the geographical distribution of demand

6. While tin consumption continues to be concentrated in *developed market economy countries*, the share of this group in world consumption has significantly decreased from over three-quarters in 1969-1971 to two-thirds in 1979-1981 and around 63 per cent in the early 1990s (see table 1 below), mostly reflecting a reduction of about 14 per cent in actual volumes of tin metal consumed by this group between 1969 and 1992. The reduction was more pronounced for primary tin metal, which decreased by 22 per cent from 158 thousand tons in 1969 down to 123 thousand tons in 1992. Conversely, the volume of secondary tin metal consumed increased by 150 per cent during this period, from 8 to 20 thousand tons.

7. The share of developing countries, including China, more than doubled during the period under consideration (1969-1992), from 11.5 to 25.1 per cent of world tin metal consumption, reflecting an increase in the volume of tin metal consumed in developing countries from 25 to 60 thousand metric tons during this period. This expansion took place principally in Asia, and particularly in China, in newly industrialized countries (Republic of Korea, Taiwan Province of China) and as a result of the development of local processing in tin producing countries (Thailand, Malaysia, Indonesia). The volume of tin metal consumed in developing countries of Asia increased three-fold, from 16 thousand tons in 1969 to 48 thousand tons in 1992. In Latin America, consumption of tin metal increased from 7.3 to 10.5 thousand tons between 1969 and 1992. During the same period, consumption of tin metal decreased in Africa from the already low level of 1.2 thousand tons to 0.8 thousand tons, or less than 0.4 per cent of world consumption.

8. Finally, in countries of Eastern Europe, consumption of tin metal increased from 29 thousand tons in 1969 (around 13 per cent of world consumption) to 41 thousand tons in 1979-1981 (around 19 per cent of the world's total), then continued to increase to 47 thousand tons in 1986, but dropped abruptly by 53 per cent, to around 22 thousand tons in 1992 (about 10 per cent of world consumption) as a result of the disruption of economic structures in the transition from centrally planned economies to market economies.

Table 1

Distribution of world tin consumption, 1969-1992
(percentage)

	1969-1971	1979-1981	1990-1992
Developed market economy countries a/	75.4	66.1	63.4
Developing countries	8.1	10.7	17.8
Of which:			
Africa	0.6	0.8	0.3
Asia	4.2	5.2	12.2
America	3.3	4.7	4.9
Others	-	-	0.4
Socialist countries of Asia (China)	3.4	4.5	7.3
Countries in Eastern Europe	13.1	18.7	11.5
World total	100.0	100.0	100.0

a/ Including South Africa

Sources: UNCTAD, based on:
- UNCTAD, Commodity Yearbook, various issues; and
- UNCTAD, International Tin Statistics, Quartely Bulletin, No.1-13.

(c) Tin end-uses

9. The two major end-uses of tin remain tinplate and solders. The former has been, however, continuously losing share while the latter has recently become the main end-use for tin and constitutes its main chances for growth.

10. Consumption of tin in tinplate has been until very recently the largest and most important market for tin, but its share in total tin consumption has been continuously declining, from around 40 per cent in the 1960s to less than 25 per cent in 1992 (see table 2 below). Given the relative stagnation of total tin consumption, this reflects a fall in actual volumes of tin used in this sector. In the period 1991 to 1992, tin used in tinplate production accounted for around 25 per cent of tin metal consumption in the United States, 15 per cent in Germany, 35 per cent in the United Kingdom, and 23 per cent in Japan. Over 90 per cent of tinplate produced is used for packaging. Tin can food containers, which are the largest segment representing over 60 per cent of tinplate consumption, are losing share to aluminium and plastics in new forms of food packaging, particularly in the frozen foods sector. The use of tinplate in beverage cans is rapidly losing market share under severe competition from aluminium. A major explanation for the increased use of aluminium for beverage cans is their relative ease of recycling.

11. Table 3 shows that world apparent consumption of tinplate has remained practically constant since 1970, at a little below 13 million metric tons. The share of developing countries in this total has increased from 6 to 27 per cent (32 per cent including China). The share of Eastern European countries has remained stagnant at around 6 per cent, while the share of developed market economy countries has decreased from 81 to 62 per cent. A closer look at the latter group shows that, between 1970 and 1992, tinplate consumption had moderately increased in the EEC and Japan, but had drastically declined in the

United States, by 64 per cent, from 5.14 to 1.86 million tons. The latter decline is the most alarming of all, in particular in view of the fact that tinplate consumption in the United States, after having stabilized at around 2.4 million tons annually during the late 1980s and even increased to around 2.6 million tons in 1990 and 1991, sharply declined by 29 per cent in 1992 to 1.86 million tons. Moreover, this decline does not appear to have come to an end. In 1993, shipments decreased by 14.5 per cent for tin-plated beverage cans, and by 2.1 per cent for tin-plated food cans. Substitution losses in favour principally of aluminium have clearly not run their full course. Neither, on a wider basis, has the threat from tin-free steel receded, in particular with the recent introduction in Japan of the "polycoated" tin-free steel can.

12. The main reason for some optimism with regard to the future of tin in this sector is the large potential for growth in developing countries as well as in countries of Eastern Europe. Their per capita consumption of tinplate is still extremely low; this figure has a tendency to grow significantly with growth in per capita income. Thus, it is 0.28 kg/year on average in Africa, but 0.06 kg in Ghana and 1.35 kg in Morocco; 2.44 kg/year in Latin America, but 0.32 kg in Paraguay and 3.60 kg in Argentina; 1.18 kg in developing countries of Asia, but 0.07 kg in Bangladesh, 0.80 kg in Indonesia, 4.29 kg in Thailand, 10.37 kg in Malaysia and 37.2 kg in Singapore; 1.85 kg/year on average in Eastern European countries; 11.86 kg/year in the EEC and 9.80 kg/year in Japan (1992 figures). To confirm the above, it should be noted that, despite the existence of excess tinplate capacity, new tinplate facilities are being installed in a number of developing countries to meet growing demand in the food packaging sector. Additions to tinplate capacity have been projected in a number of countries such as China, Indonesia, Thailand, Taiwan Province of China, the Republic of Korea and South Africa.

13. The share of tin used in solders has increased from less than one-fifth in 1963 to around one-third in 1992 (34 per cent on average in the United States, Japan, Germany and the United Kingdom (see table 2 below). Although it has been hard hit by miniaturization in the electronics industry, consumption of tin in electronic solders is expected to benefit from resumed growth in this sector, which offers the most significant growth prospects for the tin industry in the 1990s.

14. Among other uses of tin, chemicals, mainly organotin compounds, have significantly increased their share from an estimated 6 per cent in the 1970s to about 15 per cent in 1992-1993 (16 per cent on average in the United States, 25 per cent in Germany, 7 per cent in Japan). Tin has made significant commercial inroads through tin compounds used in fire retardants, pigments and paints.

15. The International Tin Research Institute (ITRI), financed by the Association of Tin Producing Countries (ATPC), announced in 1993 that it was making progress in its efforts to identify new end-uses for tin. It has, in particular, developed low-lead or lead-free solders, containing about 90 per cent tin, which, if they were to replace the conventional tin solders (with 60 per cent tin) could increase tin consumption by 20,000 tons a year. In the field of tin chemicals, ITRI is investigating the possibilities for increased use of tin compounds in fire retardants, pigments and paints where it assesses the potential for increased consumption to tens of thousands of tons of tin annually. Finally, cooperation between ITRI and companies in Western Europe has led to the development of tin foil bottle capsules to replace traditional lead foil capsules used for wine and spirits bottles, but also for pharmaceuticals. The latter have become environmentally less desirable and have even been banned in many major

tin-consuming countries. It is estimated that this new use of tin consumes already about 5,000 metric tons annually, corresponding to a little over 1 billion capsules weighing 4.5 grams each[1]. The total world market for these bottle capsules is estimated at 8 billion units annually, shared between tin, aluminium and plastics. If tin could capture half of this market, this would represent an additional consumption of 15,000 tons annually.

Table 2

Main end-uses of tin in selected major consuming countries a/
(Share in per cent)

	1963	1973	1983	1992
Tinplate	40	37	32	23
Tinning	5	4	3	5
Solder/Fusible Alloys	20	27	27	34
White metal, babitt & anti-friction metal	8	8	7	6
Bronze and brass	14	7	5	6
Other	13	17	26	26
Total	100	100	100	100

a/ 13 countries in 1963 (U.S.A., Japan, France, Federal Republic of Germany, Italy, United Kingdom, Australia, Austria, Belgium, Brazil, India, Netherlands and Switzerland); 6 countries in 1973 and 1983 (U.S.A., Japan, France, Federal Republic of Germany, Italy and United Kingdom); and 4 countries in 1992 (U.S.A., Japan, Federal Republic of Germany and United Kingdom). The percentages shown for 1973 do not significantly change if the same 13 countries selected for 1963 are considered.

Sources: UNCTAD, based on:
- International Tin Council, Tin Statistics 1963-1973, and Tin Statistics 1973-1983;
- UNCTAD, International Tin Statistics, Bulletin No.12-13, March June 1994.

[1] "Tin in July 1994", Mineral Industry Surveys, US Bureau of Mines.

Table 3

Tinplate: Apparent consumption, 1970 and 1992

	1970		1992	
	Quantity (000 tons)	Share (%)	Quantity (000 tons)	Share (%)
Developed market economy countries a/	10,271	81	8,021	62
EU b/	3,314	26	3,908	30
Japan	816	6	1,215	10
United States	5,048	40	1,858	14
Others	1,093	9	1,040	8
Developing countries	1,711	13	3,455	27
Africa	148	1	175	1
Asia	693	5	2,183	17
America	870	7	1,097	9
Socialist countries of Asia (China)	-	-	677	5
Countries in Eastern Europe	770	6	753	6
World total	12,752	100	12,906	100

a/ Including South Africa
b/ Including 12 member countries of the European Union as in 1992

Sources: UNCTAD, based on:
- International Tin Council, Tin Statistics 1963-1973;
- UNCTAD, Commodity Yearbook, various issues; and
- UNCTAD, International Tin Statistics, Quartely Bulletin, No.1-13.

B. Recent developments

(a) Regional developments

16. World consumption of tin metal continually declined by a cumulative 13.7 per cent during the 1990-1992 recession, from 257 thousand metric tons in 1989 to 222 thousand metric tons in 1992 (-2.0 per cent in 1990, -6.0 per cent in 1992, -6.4 per cent in 1992). This decline levelled off in 1993, which witnessed a modest upturn by 1.3 per cent to 225 thousand tons. Based on preliminary indications for the first half of 1994, expectations were for another modest 1 to 2 per cent increase.

17. The 1990 to 1992 decline was mainly owing to the sharp drop in Eastern European countries, where economic restructuring has been in progress (-48 per cent for the whole group and -40 per cent for the former USSR), which accounted for over half (-18,716 tons) of the decrease in the volume of world consumption. However, significant decreases were experienced in every other group, with the exception of China (see table 4 below). The slight improvement in 1993 was owing mainly to significant increases in newly industrialized countries of Asia

including China, which more than offset continuing declines elsewhere, especially in developed market economy countries and in Latin America and Africa, while declines seem to have been arrested in the Eastern European countries.

18. In 1993, tin metal consumption of the developed market economy countries further decreased by 2.5 per cent, after successive declines in 1991 and 1992 (-5.6 and -3.9 per cent, respectively). The most significant declines occurred in Japan (-17.3 per cent from 1990 to 1993), Germany (-19.2 per cent from 1990 to 1993), reflecting the fall of consumption in the Eastern part of the country, the Netherlands (-30.0 per cent), the United States (-5.0 per cent), Australia (-75.0 per cent), and Italy (-16.0 per cent). These declines were only marginally offset by small increases in some countries, notably Canada (8.2 per cent from 1990 to 1993) and Spain (13.2 per cent).

19. In developing countries, between 1989 and 1992, consumption significantly declined in Latin America (by 2,800 metric tons or -20.8 per cent) and relatively moderately in Asia (by 1,600 metric tons or -5.1 per cent), while it remained to be very small in Africa, the latter group accounting for about 1.3 per cent of world consumption, and for only around 0.3 per cent without South Africa. For developing countries as a whole, consumption of tin metal declined by about 5,000 metric tons or by 10.5 per cent between 1989 and 1992. This decline was partly counterbalanced by the growth which took place in China, where consumption has been estimated to have increased from 15,000 metric tons in 1989 to 17,000 metric tons in 1992.

20. The decline in world tin metal consumption came to an end in 1993 when consumption slightly increased to 225 thousand tons, mainly as a result of a steep rise in China (4,100 metric tons or 24 per cent) and other developing countries of Asia (5,313 metric tons or 18 per cent), which more than counterbalanced the continuing decline in developed market economy countries (-4,420 tons or -3.1 per cent between 1992 and 1993), in Latin America (-1,714 metric tons or -16.3 per cent) and in Africa (-1,133 tons or -41.2 per cent, owing mainly to the sharp drop in South Africa).

(b) Developments in selected countries

21. In Japan, in the last few years, slow economic growth and sluggish domestic demand has had a dampening effect on the level of tin demand. Solder accounts for the largest share of tin used in Japan, around 45-47 per cent. Tinplate comes next, with 26-27 per cent of tin consumption. While demand in the tinplate industry has been actually expanding both domestically and for exports, demand for solders in electronics/electrical applications had declined by 16 per cent between 1990 and 1992, and has been estimated to have continued to decline, although at a slower rate, in 1993. Miniaturization of components and circuit boards in the electronics industry is one of the reasons behind the decline in demand in this end-use sector. Also, a number of major electronics companies have shifted their production to overseas.

Table 4

World tin metal consumption, 1989-1993
(thousand tons)

	1989	1990	1991	1992	1993
Developed market economy countries	156.8	157.5	150.4	142.9	138.5
North America	50.0	48.8	46.2	46.9	46.8
EEC	61.0	61.7	56.2	55.4	54.4
Japan	38.7	39.9	39.8	35.1	33.0
Others	7.1	7.1	8.2	5.5	4.3
Developing countries	46.4	42.8	42.1	41.5	44.9
Africa	0.8	0.7	0.7	0.8	0.6
Asia	31.2	27.9	29.5	29.6	34.9
America	13.3	13.2	10.9	10.5	8.8
Others	1.0	1.1	1.1	0.6	0.5
Eastern Europe	39.1	34.9	26.5	20.4	20.3
China	15.0	17.0	18.0	17.0	21.1
World total	257.3	252.2	237.0	221.9	224.8

Source: UNCTAD, based on:
- UNCTAD, International Tin Statistics, various issues.

22. In the United States, tin metal consumption dropped by 7.4 per cent between 1989 and 1991 and decreased again by 2.2 per cent in 1993 after a slight improvement in 1992, although the United States economy was the most buoyant of the leading industrial countries (industrial production grew by 2.4 per cent in 1992 and 4.0 per cent in 1993), giving rise to serious concerns regarding future prospects for tin. This poor performance reflects the fact that aluminium continues to take up an increasing market share in the beverage and automobile industries. In 1989-1990, solder and tinplate together accounted for close to two-thirds of tin metal consumed in the United States (36 and 26 per cent, respectively). Reported consumption of tin in both applications declined significantly between 1991 and 1993.

23. In the Commonwealth of Independent States (CIS) and in Eastern Europe as a whole, severe economic difficulties have led to an overall reduction in industrial activity and income. These developments, combined with a scarcity of foreign exchange, have led to a general decline in demand for minerals and metals including tin.

24. In China, the adoption of ambitious economic reforms, the acceleration of GDP growth and massive investments in food canning industries have fuelled Chinese tin demand which has a great potential for a further increase. Over the decade, China has been one of the fastest-growing tin metal consuming countries, ranking third after the United States and Japan in 1993. China is playing a key role in the world tin market and will continue to influence tin trade flows in the coming years.

II. SUPPLY

A. Mine production

25. For several decades, mine production of tin has been and remains characterized by a high level of concentration. As shown in table 6, eight to ten countries account for over nine-tenths of world production, while the five largest among them account for close to three-quarters of the world's total. Some major shifts have taken place, however, in the relative importance of these countries.

(a) Changes in the geographical distribution of production

26. The most important development of the past ten years, particularly after the major fall in tin prices which followed the collapse of the International Tin Agreement in October 1985, has been the replacement to a large extent of the traditional tin producing countries of South East Asia, particularly Malaysia and Thailand, with relatively new low-cost producers, in particular China, Brazil and Peru.

27. In the past few years, substantial changes in levels of tin production have reflected the relatively high price elasticity of tin supply, even in the short term. Persistent low prices have put strong pressure on higher cost producers to diversify and to reduce the importance of, and their dependence on, the tin industry. This was particularly the case in Malaysia and Thailand. In Malaysia, the mining industry has been overshadowed by the robust growth of the other more dynamic economic sectors such as manufacturing, tourism, and the services sector. In Thailand, tourism offered better prospects of returns than the tin industry, especially in Phuket.

28. Tables 5 and 6 show that between 1980 and 1993 the share of developing countries of Asia (essentially Indonesia, Malaysia and Thailand) in world mine output of tin had decreased from over half to a quarter. Of the three major producers considered, only Indonesia increased its share (from 9 to 15 per cent of world output), while the combined share of Malaysia and Thailand dropped abruptly from over 40 per cent to less than 10 per cent. During the same period, China increased its share from 7 to 27 per cent of world output, becoming the largest world producer, mining alone more tin than all other Asian developing countries continued. In Latin America, Brazil and, more recently, Peru have emerged as major tin producers.

(b) Production and capacity utilization

29. At the beginning of the 1990s, world mine production of tin reached record lows, below its levels of the late 1950s. It declined from around 235 thousand metric tons annually in 1979-1981 to around 190 thousand metric tons in 1986-1988, after the collapse of the tin market. In response to improved demand and expectations, it increased to a new peak of close to 240 thousand metric tons in 1989, before progressively sliding back to the record low of 178 thousand metric tons in 1992. The recent economic recovery has pushed tin mine production up by 6.5 per cent to 189 thousand metric tons in 1993.

30. Since the mid-1980s, world tin mining production capacity has also significantly declined as a large number of mines around the world were closed, especially in South-East Asia, Latin America and Europe. Production in the former USSR had also declined as high grades were being depleted and the tin industry

experienced difficulties in upgrading the ore and disposing of such materials as arsenic and sulphur. Table 2 of the annex shows mine capacities in the world in December 1991. When compared to actual levels of output, this table illustrates the substantial reduction in the number of tin mines still operational and the shrinkage of tin mining. World mine capacity amounted to 303 thousand metric tons in 1991 while actual output was around 187 thousand tons (62 per cent of capacity utilization).

31. The serious problems the world tin industry went through in the past few years, as outlined above, especially continuing low prices, have indeed led most producers to adopt rehabilitation programmes, to lower their production costs and to close down economically non-viable mines. At present, the average production costs worldwide are estimated at about US dollars 5,800 per metric ton. It is only at Bom Futuro, in Brazil, where the costs of production of the Garimpeiros are below this level, because no taxes or social charges are paid and they operate with little regard to the environment.

Table 5

Distribution of world tin mine production, 1970-1993
(percentage)

	1970	1980	1990	1992	1993
Developed market economy countries	6.6	8.1	8.1	6.9	8.4
Developing countries	78.1	77.3	64.3	60.0	57.4
Africa	8.1	4.0	2.2	1.4	1.2
Asia	53.1	57.8	33.8	31.2	25.1
America	16.8	15.5	28.3	27.4	31.1
Countries in Eastern Europe	5.1	7.6	6.9	5.6	5.3
Of which: Former USSR	4.6	6.8	6.7	5.6	5.3
Socialist countries of Asia	10.2	7.0	20.7	27.5	28.9
Of which: China	10.1	6.8	19.8	25.3	26.9
World total	100.0	100.0	100.0	100.0	100.0

Sources: UNCTAD, based on:
- UNCTAD Commodity Yearbook, various issues; and
- UNCTAD, International Tin Statistics, Quartely Bulletin, various issues.

Table 6

Tin mine production in major tin-producing countries, 1970-1993
(thousand tons)

	1970	1980	1990	1991	1992	1993
Indonesia	19.1	32.5	31.7	30.1	28.3	28.6
Malaysia	73.8	61.4	28.5	20.7	14.3	10.4
Thailand	21.8	33.7	14.4	10.1	11.5	7.5
China	22.0	16.0	44.0	39.0	45.0	51.0
Bolivia	30.1	27.5	17.2	16.8	16.5	18.6
Brazil	3.6	6.9	40.4	29.5	21.7	25.9
Peru	0.1	1.1	5.2	6.5	10.4	14.3
Nigeria	8.0	2.5	0.2	0.2	0.2	0.1
Australia	8.8	11.6	7.4	5.4	6.6	8.1
USSR (Former)	10.0	16.0	15.0	12.0	10.0	10.0
Total Above:	197.3	209.2	204.0	170.3	164.5	174.5
World:	217.9	235.9	222.5	187.5	177.7	189.3
Per cent of world:						
- 10 countries above:	91	89	92	91	93	92
- 5 largest producers above:	77	73	73	73	71	73

Sources: UNCTAD, based on:
- UNCTAD Commodity Yearbook, various issues; and
- UNCTAD, International Tin Statistics, quarterly Bblletin, various issues.

B. Tin metal production

32. The geographical distribution of tin metal production and its evolution between 1970 and 1993 reflect that of tin mine production over the same period, with some significant exceptions (see table 7). The latter relate to cross-border toll smelting in countries with excess smelting facilities of concentrates produced in countries without smelters or enough smelting capacities. This is the case in particular for Asian countries which globally smelt around 60 per cent more tin-in-concentrates than they actually produce, while Latin American countries globally process less than three-quarters of their tin mine output. This is also the case for developed countries, which either have recently closed their smelters for economic reasons (e.g., Germany, United Kingdom), or are producers of tin-in-concentrates without having corresponding smelting facilities (e.g., Portugal, Australia).

33. The contraction of mine output worldwide has led to important shortages in feedstocks which have affected quite dramatically some smelters around the world. In order to survive, a number of smelters have had to devise new ways of work

such as being able to treat complex ores and to produce according to individual specifications. Many others have closed down recently, mainly in tin concentrate importing countries (Germany, Republic of Korea, United States and United Kingdom).

34. Table 2 of the annex shows world tin smelting capacities. It illustrates the large proportion of existing idle capacity, despite the various closures which have taken place in the past few years. World tin smelting capacity amounted to some 408 thousand metric tons in 1991 and actual tin metal production was around 190 thousand metric tons of primary tin metal, a capacity utilization ratio below 47 per cent.

Table 7

Distribution of world tin metal production, 1970-1993
(percentage)

	1970	1980	1990	1992	1993
Developed market economy countries	26.3	15.2	13.0	4.8	4.0
Developing countries	59.0	70.8	63.8	67.1	63.1
Africa	4.5	1.7	0.5	0.5	0.5
Asia	52.4	57.6	41.0	46.1	40.0
America	2.1	11.5	22.3	20.5	22.6
Countries in Eastern Europe	5.0	7.8	8.1	7.0	6.4
Of which: Former USSR	4.4	6.9	7.9	7.0	6.4
Socialist countries of Asia	9.7	6.1	15.1	21.1	26.5
Of which: China	9.7	6.1	14.9	20.2	25.3
Total	100.0	100.0	100.0	100.0	100.0

Sources: UNCTAD, based on:
- UNCTAD Commodity Yearbook, various issues; and
- UNCTAD, International Tin Statistics, Quartely Bulletin, various issues.

C. Secondary Tin metal

35. Efforts to recycle and produce tin from scrap through detinning has resulted in increased output especially in developed countries of Europe and North America as well as in Japan. Environmental pressures and the adoption of new regulations have encouraged greater activity in recycling of tin scrap. However, although increased recycling has led since the late 1980s to a significant jump in the volume of recovered tin metal, secondary tin still accounts for a much lower share of total metal supply than in the case of most other major metals. For several decades, until the mid-1980s, secondary tin accounted for between 4 and 6 per cent of total tin metal supply. Since the late 1980s, it accounts for close to 10 per cent of total tin metal supply, compared to around 26 per cent for aluminium, around 35 per cent for zinc, around 40 per cent for nickel, and around 59 per cent for lead.

36. Developed market economy countries account for four-fifths of world production of secondary tin metal. In order to keep the tin canning industry competitive, there has been a remarkable surge in tin can recycling efforts. The United States Steel Recycling Institute (SRI) has reported that the steel can recycling rate had reached 48 per cent in 1993, corresponding to about 1.3 million tons of material, a 17 per cent increase over 1992. It had expected to reach the goal it had set of 66 per cent recycling rate by 1995[2]. In Germany, the tin can industry achieved a 48 per cent recycling rate in 1994. In the United Kingdom, the Government had set a target of recycling 50 per cent of available materials in the waste stream, by the year 2000. The European Union has currently been recycling about 25 per cent of its steel cans. In Japan, Nippon Steel Corporation, which started recycling used steel cans at Kimitsu in 1984, plans to reach a level of 2,000 metric tons of recycled material within 1 or 2 years[3].

37. Since 1990, production of secondary tin metal in the countries of Eastern Europe has also expanded. It has been standing at an estimated 3,000 tons annually. In developing counties, recycling still remains small, although statistical information is often not available as this type of activity is not organized at an industrial scale.

D. Regional and country developments

1. Asia

38. In China, estimates indicate that tin concentrates output, after more than doubling between 1985 and 1989 from 22 to 46 thousand metric tons, remained constant in 1990, declined to 41 thousand metric tons in 1991 and increased to about 49 thousand metric tons in 1992 and to 51 thousand metric tons in 1993. For tin metal, estimates indicate that production jumped from 28 thousand metric tons in 1989 to 36 thousand metric tons in 1990, remained more or less constant at that level in 1991 and 1992, then jumped again to an estimated 51,000 metric tons in 1992. Since 1990, China has become the world's largest tin mine producer, and since 1993 has the world's largest tin smelter output. Most indications point to the increasing importance of China as a supplier of tin. Its supplies are expected to exert continuing pressure on the world tin market.

39. In Indonesia, a serious restructuring programme to rehabilitate this important economic sector has been adopted in recent years, providing for a severe contraction of employment (halving of the work force of 24,000) and a reduction in production costs through subcontracting of onshore mines, closing down of uneconomic offshore operations and rehabilitation of others[4]. Unlike other producers in the region, such as Malaysia and Thailand, Indonesia is almost alone in successfully reigning in its operating costs, so as to ensure the longer-term survival of its domestic tin mining. The two major companies operating in the country, P.T. Tambang Timah (State-controlled) and P.T. Koba Tin (subsidiary of the Australian company Renison Consolidated Goldfields Ltd), are reported to have some of the lowest-cost operations in the world. As a result, Indonesia has maintained the level of its mine production and has ranked, since 1992, the world's second largest tin mine producer, after China, and third tin

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[2] "Tin in March 1994", Mineral Industry Surveys, US Bureau of Mines.

[3] "Tin in June 1993", Mineral Industry Surveys, US Bureau of Mines.

[4] The stringent restructuring programme was designed to bring costs of production in line with the depressed tin price. Indonesia closed its operations on Belitung and Singkep Islands and consolidated its tin production on Bangka Island. It also moved its headquarters from Jakarta to Bangka Island.

metal producer, after China and Malaysia. Production of tin concentrates, which fell from 30 to 28.5 thousand metric tons between 1991 and 1993, is expected to recover in 1995 following the expansion programme being implemented by Koba Tin. The 1991-1993 production of tin-in-concentrates is about 26 per cent above the level of 1984-1986.

40. Malaysia, which had been for decades the world's largest tin producer until 1986, now ranks sixth and could slide further down the scale as more mines are closed. Mine production has been continuously declining, practically every year since 1979, from 63,000 metric tons to 10,384 metric tons in 1993. In 1993, the total number of mines still in operation was merely 88 (and even 63 according to some reports) compared to 321 four years earlier and 873 in 1979. In 1994, employment in the domestic tin mining industry had fallen to 3,064 compared to over 39,000 in 1979-1980; the Government has demonstrated that it will provide no further support. On 1 May 1993, Malaysia Mining Corporation (MMC), the largest mining tin company in the country and formerly the world's largest tin mining company, announced its withdrawal from tin mining in Malaysia, after having registered losses for the third consecutive year in a row in its tin mining operations. However, the company has not abandoned tin entirely. It has retained its 42 per cent ownership in Malaysia Smelting Corporation (MSC) and indicated its willingness to participate in tin joint-ventures in lower cost countries.

41. With production costs in Malaysia running at around 16 ringgit per kg compared to market prices of less than 12-13 ringgit per kg it will not be surprising if more tin mining operations close down as high costs, poor ore grades and declining prices force tin miners into more lucrative sectors[5]. Ore grades have diminished considerably and available ore reserves are on the decline. Moreover, much potential mining land has become economically unviable for mining because its surface value for other uses has become much higher. Consequently, there is no guarantee that a major price rise could trigger a substantial recovery.

42. While the Malaysian mining industry had declined significantly, the Malaysian smelting and local tin products manufacturing industries have succeeded in maintaining their level of activity. The two Malaysian smelters, namely the Malaysia Smelting Corporation (MSC) and Datuk Keramat Smelting (DKS), are still the largest in the world. They have enabled Malaysia to retain its position as the world's largest tin metal exporter, and the second tin metal producer after China. In recent years, while operating rates have been quite low in most smelters around the world, the above two smelters were successful in attracting a large proportion of feedstocks for treatment at their plants, and thus in maintaining full capacity utilization. Tin metal production in 1993 was, however, 10.7 per cent below its 1992 level, standing at 40,700 metric tons.

43. In Thailand, where tin was once the country's largest export revenue generator, both tin mining and tin smelting have continued their downward trend in recent years. Like Malaysia, mine production has been continuously declining, practically every year since 1979, from 34,000 metric tons to 7,500 metric tons in 1993. In 1993, the total number of mines still in operation (excluding suction boats, which were over 2,000 in 1980 and have subsequently almost completely disappeared) was merely 30 compared to close to 742 in 1980. Employment in tin mining had fallen to 14,022 in 1990 compared to over 70,000 in 1980.

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[5] Metal Bulletin, Thursday 15 July 1993, page 7.

44. Four factors have directly contributed to this decline: the closure of several mines owing to persistent low tin prices; the depletion of high-grade deposits; the loss of land to the rising tourist industry; and environmental protection, in particular with a view to promoting tourism. In addition, other industries such as tourism, real estate, rubber, palm oil and shrimp farming have drawn investment away from tin mining in the South, where most tin reserves were located.

45. For tin metal, unlike Malaysia, their production has mostly followed the downward trend of tin mining; it has continuously declined from the peak of 34,689 metric tons in 1980 to 8,276 metric tons in 1993. Thaisarco, the sole tin smelter still operational in the country, is operating at about 25 per cent of its 30,000 tons/year capacity, despite attempts to import tin-in-concentrates. Recently, Thaisarco has successfully developed a relationship with the Government of Lao Peoples Democratic Republic providing assistance in the form of technical advice and the advance purchase of its concentrates. Thaisarco is currently evaluating the results of an exploration programme there with a view to a possible joint venture or service contract to develop local tin deposits[6]. Thaisarco is gradually increasing its tin concentrates imports and has concluded a two-year tin concentrate supply agreement with Australia's Renison. Attempts have also been made to import material from Myanmar.

46. In the Republic of Korea, the Korea Zinc Co. ceased producing tin metal in the course of 1991. Closure of its 1,800 metric tons per year smelter was attributed to the rising cost of feedstock and weak tin prices. The smelter produced 850 metric tons of tin in 1990. In recent years the smelter has been modified to treat low-grade concentrates supplied from China. The other tin producer, Lucky Metal Co., has a small smelter at Changhang. Because of the rising cost of feedstock, it cut its production by an estimated 30 to 40 per cent in 1992.

2. Africa

47. In developing Africa, tin concentrates production has continued its downward trend and stood at 2,240 tons in 1993 while rated mine capacity was estimated at some 15,500 metric tons (see table 2 of the annex). This production is concentrated in six countries: Zaire, 700 tons; Zimbabwe, 658 tons; Rwanda, 500 tons; Morocco, 150 tons; Nigeria, 130 tons; and Burundi, 50 tons. The level of smelting activities had also declined, as primary tin metal output stood at only 900 metric tons in 1993, less than 0.5 per cent of total world production.

48. In Zaire recent political and economic problems have affected the level of tin output which declined from an estimated 1,600 metric tons in 1990 to 700 metric tons in both 1992 and 1993. In Zimbabwe, the Government announced in 1993 plans to privatize the country's largest tin mine, the Kamativi mine. Legislation was expected to be passed that would enable the mine to be sold by the Nationalized Zimbabwe Mining Development Corp. (ZMDC) to private investors or other mining corporations. Kamativi has been a high-cost producer and has had continuing financial problems since the 1985 international "tin crisis" and subsequent low market prices. ZMDC took over Kamativi in 1987 from the Industrial Development Corporation. At mid-1993, ZMDC announced the layoff of 900 people out

[6] Metals Week, 24 May 1993, page 3.

of a total work force of 1,362. The aim was to reduce costs. Underground mining was to be gradually phased out. Future production would be from the open pit section of the mine.

49. In Nigeria tin is mined from alluvial deposits by two major companies: Consolidated Tin Mines Ltd and Nigeria Tin and Allied Minerals Products Ltd. All tin concentrates are shipped to the sole tin smelter, the Government-owned Makeri Smelting Co., in Jos, Plateau State. Makeri continues to operate well below capacity (see table 2 of the annex). The Government officially permitted only refined tin to be exported, on which a 15 per cent royalty is charged. These exports are then marketed by London-based Decacia International Ltd. In order to avoid the export tax, substantial amounts of tin concentrates are purpotedly smuggled out of the country.

50. In Burundi, tin is mined across the northern part of the country, where small pits are worked by local artisans. The deposits of cassiterite are alluvial and the small quantities of tin produced (50 tons of tin-in-concentrate each year in 1991-1993) are sold to ore buyers in Bujumbura who accumulate it and ship it to smelters.

51. In South Africa, between 1990 and 1993, production was estimated to have declined from 1,140 to 500 metric tons for tin-in-concentrates, and from 2,410 to 540 metric tons for primary tin metal. The decrease was the result of problems encountered in recent years by the South African tin company, Rooiberg Tin. In April 1992, Rooiberg implemented a survival plan to stave off possible closure while accelerating the rehabilitation programme. Under the plan, mining operations were refocused on selective high-grade ore reserves, and mine throughput was cut from 15,000 to 6,000 metric tons per month. The company is continuing to operate at that level. This has led to lower refined metal production at the Rooiberg smelter, which is operating at only about 25 per cent of its 2,000 tons/year capacity[7].

3. Latin America

52. Brazil became the largest world tin mine producer in 1987, and maintained that position until 1989, when its production peaked at close to 55,000 metric tons. As tin prices recovered in 1988-89, most producers, especially the *garimpeiros*, responded to higher prices with increased production. Brazilian output of tin-in-concentrates declined sharply thereafter, to 40,400 metric tons in 1990, 29,500 metric tons in 1991 and 21,700 metric tons in 1992, mainly because of the Brazilian Government's concern that indiscriminate mining activities in the Amazon region were environmentally harmful, and possibly also because of the realization by the largest tin exporting company, Paranapanema, that large production volumes might not be in its own interest. In 1993, however, some recovery took place, with an output of 25,900 metric tons (27,000 metric tons according to some sources). The number of mines in operation decreased from ten in 1989 to four in 1993 (Bom Futuro, Pitinga and two smaller mines). For 1994, it was expected that tin production would decline again to about 22,000 tons as a result of production cuts by major companies.

53. Parapanema SA is Brazil's major tin producer. It owns the high grade Pitinga mine and holds a 52 per cent stake in Empresa Brasileira de Estanho SA (Ebesa) which holds the mining rights for the Bom Futuro tin reserves in the Amazon

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[7] "Tin in March 1993", Mineral Industry Surveys, US Bureau of Mines.

region. It decided in 1994 to reduce its tin ouput to about 7,000 metric tons for 1994, after its decision to cut it from 16,000 metric tons in 1992 to 13,000 metric tons in 1993[8]. Another member of Ebesa, Mineraçao Canopus, the coutry's fourth largest tin mining company, reduced output at its mines in Para state in three successive stages, from 1,500 to 1,200 tons/year in 1991, then to 720 tons/year as from June 1993, and finally to 480 tons per year starting in September 1994, as the prevailing world tin prices made production unviable. Canopus is unlikely to increase output again until LME prices rise over US dollars 6,000 a ton[9]. The legal dispute between Ebesa and the *garimpeiros* over extraction rights in the Bom Futuro tin mine continued for most of 1993 and 1994. Production at Bom Futuro has almost all been done by *garimpeiros*.

54. Cooperation is being developed with neighbouring Bolivia, a traditional tin producing country. Paranapanema announced the signing of a lease with COMIBOL, the Bolivian state-owned mining company. Under the lease, Paranapanema would invest $12 million to exploit the tin reserves at the Catavi mine, in Oruro province in Bolivia, for 20 years, with renewal rights. Production was scheduled to begin in late 1993. Paranapanema would pay COMIBOL royalties on the ore produced based on market prices, and would contract with three local tin smelters for the processing of tin concentrate.

55. The 1985 tin crisis had a severe impact on the tin industry of Bolivia, when production of tin-in-concentrates collapsed from 20-25,000 tons annually to a record low of 8,129 tons in 1987, while that of tin metal dropped from 14-16,000 tons annually to another record low of 2,000 tons in 1987. Since 1989, production has begun to recover strongly. For tin-in-concentrates, it had reached 17,248 metric tons in 1990, declined slightly in 1991 and 1992 then increased again in 1993, to 18,634 metric tons. The recovery was more dramatic for tin metal, which had multiplied seven-fold to 14,658 metric tons in 1991 and increased again to 18,551 metric tons in 1993.

56. The improvement in output was the result of a serious restructuring exercise of the Bolivian tin industry adopted by COMIBOL, the largest state-owned enterprise and the country's main tin producer. Its work force has been reduced from over 30,000 to about 6,000 people. Plans are to change COMIBOL into a mostly administrative function overseeing the mining contracts of various private firms. The State is expected to play a smaller role in the industry as it opens up more to private investment. COMIBOL has been expanding its rationalization scheme, in response to World Bank recommendations. However, some resistance has been organized against this policy as strikes of miners, in the second quarter of 1992, took place to protest against COMIBOL's joint venture plans (involving take-over plans by the private sector).

57. Unlike other producers, Peru, the third largest tin producer in Latin America after Brazil and Bolivia, has increased significantly its production of tin-in-concentrates from around 5,000 metric tons in the late 1980s to 6,500 metric tons in 1991, 10,445 metric tons in 1992 and 14,310 metric tons in 1993, thus becoming the world's fifth largest tin mine producer. As there is no tin smelter in Peru, the privately owned Mineras Sur SA (Minsur), the only tin

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[8] "Tin in March 1994", Mineral Industry Surveys, US Bureau of Mines.

[9] Because of the geological make up of its mines, which are based on both alluvial and rock cassiterite deposits, it is not economically worthwhile to mine at prices below US dollars 6,000 a ton. Reserves at its three mines sites are limited and so the company plans to save exploiting them until the price goes up.

producer in the country, has concluded tolling agreements with various smelters. In the past, these agreements were made with smelters outside Latin America such as Capper Pass in the United Kingdom and Tex-Tin in the United States. More recently, Minsur has made similar deals with Potosi (Mexico) and currently has similar contracts with CESBRA (Brazil) and the two Malaysian tin smelters. A contract has also been negotiated with Bolivia's state-owned smelting organization, ENAF, for the toll treatment of 3,600 tons of tin concentrate.

58. In 1994, Minsur signed a contract with Australia's Ausmelt Ltd. to utilize its technology in a new tin smelting plant to be built by Finsur (a wholly owned subsidiary of Minsur) at Pisco. This plant was expected to start operations by late 1995 with an initial annual capacity of 30,000 metric tons of tin concentrates, yielding 16,000 metric tons of tin metal, sufficient for processing all locally produced tin concentrates from the Minsur's San Rafael Mine[10].

59. In Mexico, the Metales Potosi smelter has been able to increase the level of its operating rate to almost full capacity, especially in 1992. Potosi toll processes tin concentrate from Portugal, Bolivia, Zaire, Peru and Australia. Operating levels were as low as 40 to 50 per cent, but improved as more tin concentrates became available as a result of tin smelter shut-downs around the world. However, in order to reduce its dependence on one commodity, the firm is starting a 5 million dollar facility to recover metals from low-grade copper scrap.

4. North America

60. Continuing low tin prices and the strength of the Canadian dollar, which have caused losses of $ CAN 95 million since 1988, led Rio Algom in Canada to close its East Kempville mine in January 1992 (the mine produced tin-copper-zinc concentrates and had a capacity of 5,000 metric tons per year of tin). Some 250 people were employed. This explains the lack of tin mine production in Canada since 1992.

61. The only tin smelter in the United States of America, the Texas City, Texas facility of TexTin Corp closed down in 1989 owing to continued low tin prices and difficulties in obtaining feedstocks. This smelter had treated tin concentrates imported from Bolivia and Peru, as well as some domestic tin concentrates and some accumulated secondary residues. TexTin ceased tin production and converted its equipment to process secondary copper. In the course of 1993, in view of the increasing importance of recycling of tin scrap as a source of tin metal, MIDCO Inc., St Louis, Missouri, announced the start up of its new tin smelter designed to produce Grade A from secondary sources. The tin will be sold in ingot form and the MIDCO brand has been sanctioned by the LME. Expected production would be 3,000 tons annually.

5. Eastern Europe

62. In Eastern Europe, production of tin concentrates is now taking place only in the former USSR, where it is estimated to have remained at the same level in 1993 as in 1992, namely 10,000 metric tons, about one-third below its level of the 1980s. Tin metal production of the former USSR is also estimated to have remained in 1993 at the same level as in 1992, at around 13,000 tons, some 30 per cent below the 1990 level. Lower tin production reflects two major developments:

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[10] "Tin in May 1994", and "Tin in August 1994", Mineral Industry Surveys, US Bureau of Mines.

on the one hand, the Novosibirk Tin Integrated Works, the main tin smelter in the former USSR, went through drastic changes as a result of political developments which took place in the past few years. The company, like most of the industry, had to adapt its structure from a centrally regulated company with fixed levels of output and prices to a privately managed company responsible for all its own management decisions, including finding the required hard currency for the purchase of inputs and materials. The smelter was reported have operated much below capacity, owing to raw material shortages. On the other hand, the company faced major problems for the internal distribution of tin to its end-users.

6. Western Europe

63. Since the beginning of the 1990s, Portugal has emerged as a new tin-producing country with the largest copper/tin mine in Europe, Somincor's Neves Corvo mine in the southern part of the country. Production of tin-in-concentrates has jumped from 63 metric tons in 1989 to 3,125 metric tons in 1991, then to 5,337 tons in 1993. Somincor sells most of its tin concentrates to the Zamora tin smelter (Spain) and the remainder to the two tin smelters in Malaysia.

64. In the United Kingdom, attempts to raise financing in order to keep the last active tin mine, the South Crofty mine in Cornwall, in operation have succeeded in 1994. With the waiving by the Government of the repayment of some US$ 35 million in loans made to the mine since 1985, the latter is now expected to operate at least until the end of 1995. A price of US$ 6,000 per ton (10 per cent above the price prevailing in mid-1994) was considered necessary for the mine to be profitable. In 1993, the mine treated 180,000 metric tons of ore to produce 2,200 metric tons of tin-in-concentrates. After the closure of the Capper Pass smelter in 1991 owing to a shortage of feed and increased operating costs, all the mine's output has been shipped to the DKS tin smelter in Malaysia for processing[11].

65. In the Eastern part of Germany, high operating costs and environmental problems caused the closure of the only tin smelter in Saxony. The firm was previously known as VEB Altenburg, before changing to Saxonea A.G. in 1990 when Germany was reunited. Depressed tin prices and low-grade feedstock also contributed to the plant's closure. Tin concentrates were sourced locally but contained only 3 to 5 per cent tin and high amounts of sulphur. Output of sulphur dioxide during the smelting process was too high to meet German emission standards, and pollution-abatement equipment could not be afforded. The plant employed 840 workers. All tin produced was consumed locally .

66. Also in Germany, Metallgesellschaft closed in 1994 the Duisburg smelter, its last tin smelter. This smelter, which produced high grade tin-based solders, was already producing at 30 per cent of its 10,000 tons/year capacity and had become unprofitable owing to low tin prices[12].

67. In the Netherlands, during the course of 1992, Billiton Ltd ceased gradually production of primary tin and secondary lead at its smelter in Arnhem. Billiton's decision to close the plant - which had a capacity of 4,000 metric tons of tin and 10,000 metric tons of secondary lead annually - was taken in view of a number of factors, namely the prevailing low tin and lead prices, the need to make a

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[11] "Tin in August 1994", Mineral Industry Surveys, US Bureau of Mines.

[12] "Tin in April 1994", Mineral Industry Surveys, US Bureau of Mines.

substantial investment to modernize the lead side of the facility to meet environmental regulations, a persistent over-supply of tin ingot inventory worlwide, and worldwide excess of tin smelter capacity relative to tin mine capacity.

7. Oceania

68. Like traditional tin-producing countries, the tin industry of Australia faced serious difficulties after the 1985 tin market crisis, which had resulted in a reduced level of output throughout the second half of the 1980s and the early 1990s. However, production started to recover in 1992 (nearly 23 per cent up over 1991) and had increased again in 1993 by 22 per cent to 8,057 metric tons.

III. INTERNATIONAL TRADE IN TIN

69. International trade in tin has been characterized, and more so recently, by the fact that the volume of world exports or imports of tin metal is almost equal to world primary tin metal production or consumption. This reflects the fact that in the case of tin, unlike most other major metals, the main consuming countries have neither a significant tin mine production nor a significant tin smelting activity.

70. Two significant developments of the past few years need to be highlighted: on the one hand, the replacement of tin-in-concentrates imports by tin metal imports in some major consuming countries, following the recent closure of their tin smelters. This was the case for example in the United Kingdom, the Netherlands, and the Republic of Korea. Only 19 per cent (35,919 tons) of world mine production was exported in the form of tin concentrates in 1993 against 24 per cent (57,657 tons) in 1989. On the other hand, the drastic reduction in tin-in-concentrates exports from China (from 21,828 tons in 1989 to 2,170 tons in 1993) and the opposite jump in tin metal exports from China (from 9,874 tons in 1989 to 36,268 tons in 1993).

71. The main trading partners, i.e. the 10 largest exporters and importers of tin metal have remained almost the same since 1981. There were, however, significant changes in their relative importance as shown in table 8. Thus, on the export side, Malaysia has maintained its number one position with regard to tin metal, China and Brazil have moved to the top positions behind Malaysia, while Indonesia has lost two-fifths of its market share and Thailand has recently become a minor tin exporter and might even soon become a net tin importer if its domestic consumption continues to increase.

72. On the import side, there were fewer changes are less important. The United States, Japan and Germany have continued to occupy, in that order, the three leading positions, although their share has globally decreased from 54.3 to 44.7 per cent of world imports. The shares of the Republic of Korea and Taiwan Province of China have siginificantly increased, while the share of the former USSR has drastically declined from 8.2 to 2.8 per cent.

Table 8

Major tin trade partners 1981 and 1993
(Tin metal)

Major Exporters	Share of World exports (%)		Major Importers	Share of World imports (%)	
	1981	1993		1981	1993
1. Malaysia	35.5	21.1	1. USA	26.9	19.0
2. China	3.0	20.9	2. Japan	17.5	15.5
3. Singapore	1.4	15.8	3. Germany	9.9	10.2
4. Brazil	2.6	12.7	4. Hong Kong	1.0	9.3
5. Bolivia	9.6	10.7	5. U.K.	4.7	7.2
6. Indonesia	17.1	10.3	6. Korea, Rep. of	1.2	5.1
7. Belgium	9.4	3.6	7. France	5.1	4.3
8. Thailand	17.1	1.9	8. Taiwan, P of China	0.0	3.8
9. USA	1.3	1.0	9. Italy	2.8	3.0
10. Mexico	0.0	0.3	10. F.-USSR	8.2	2.8
Total above	97.0	98.3	Total above	77.3	80.2

Source: **UNCTAD secretariat calculations ...**

IV. TIN STOCKS AND PRICES

A. Tin stocks

73. When the international tin market collapsed on 24 October 1985, the International Tin Council's stockpile, including physical metal and contracts for future deliveries, stood at over 100,000 metric tons. The very high level of these stocks had a strong dampening effect on the world tin market for a number of years. Since 1985, tin stocks have been steadily reduced, partly as a result of a deficit in world supplies. While country stocks reported in the western world have fluctuated between 25,100 and 34,100 metric tons between 1985 and 1992, the LME stocks had decreased sharply from 58,000 metric tons in 1985 to 5,700 metric tons in 1988 when tin quotations were suspended. When tin trading resumed on the LME in June 1989, LME stocks started to increase, but fluctuated afterwards without ever reaching 22,000 metric tons, until the end of February 1994 (see table 1 of the annex). Since then, they have been increasing regularlyu up to the end of June 1994, when they stood at 30,880 metric tons, corresponding to seven weeks of world tin consumption. This is by no means excessive, particularly when compared to LME stocks for other major metals (15 weeks for zinc, eight weeks for lead, and nine weeks for unwrought aluminium). Consequently, overall tin stocks in the western world at present, estimated in the range of 55-60,000 metric tons, much above the level of 20,000 metric tons which the Association of Tin Producing Countries (ATPC) hoped would be reached by the end of 1993.

74. The United States Defense Logistics Agency tin stockpile (DLA) stood at 171,200 tons in 1989. Sales which amounted to 2,000 tons per year were increased by 200 per cent to 6,000 tons in 1991, 8,815 tons in 1992 while the ceiling had been raised to 12,000 tons for 1993. The actual level of sales amounted to

6,022 tons for 1993 and to 4,240 tons for the first nine months of 1994. The overall level of the DLA tin stockpile has been reduced to 143,638 metric tons. DLA's stepped up sales were criticized by tin producers. While the sales are comparatively a small percentage of the market, the adverse effects are considered to be disproportionately large owing to the timing and nature of the sales.

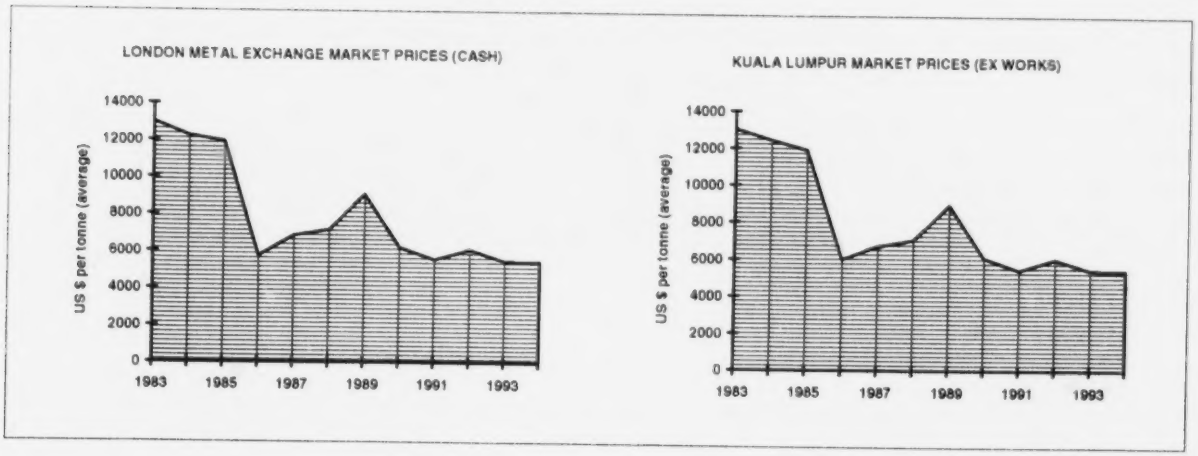
B. Tin Prices

75. Tin prices collapsed from $US 12,389 per ton in October 1985 to a trough of $US 5,485 in June 1986. They progressively increased afterwards to a peak of 10,297 in April 1989 (monthly price averages). They progressively declined afterwards, with minor fluctuations, until they reached a record low on 4 October 1993, when tin settled on the LME at US$ 4,375/ton. Since then, they have somewhat improved, standing at $US 5,318 in September 1994 (see chart).

76. Regarding the price of tinplate, it has remained weak in recent years. The existing overcapacity and supply combined with continuing weak demand in the key industrial markets of Europe, the United States and Japan have kept tinplate prices low.

77. The fact that, in April 1994, China formally joined the Association of Tin Producing Countries (ATPC) and has agreed to meet a 1994 export quota of 20,000 metric tons under the Supply Rationalization Scheme (SRS) enforced by ATPC, and the structural decline in the world mining industry should ensure that there would be no further increase in inventories in 1995. On the opposite side, the relatively high level of stocks and the diminishing market shares in tin's leading applications do not augur well the metal in the near future. On balance, for the rest of 1994 and 1995, prices may be expected to hold, with some possibilities for increases when the economic recovery intensifies in Europe and Japan and its effects spread to developing countries.

Tin prices 1983-1994



V. TECHNOLOGICAL AND ENVIRONMENTAL ISSUES

78. Increased environmental awareness in the world has led to pressures on Governments to adopt policies and new legislation in favour of the protection of the environment and health of populations. In the case of tin, these pressures were felt mainly in two areas: one being the concerns expressed by environmental groups regarding the use of lead in the solder and food canning industries. Lead is usually a co-alloy of tin. The second area relates to the disposal and recycling of food cans. Consequently, new legislation and strict guidelines had been enacted by various Governments especially in the industrialized countries of western Europe, the United States and Japan.

79. Some consumers have become increasingly discriminating about the tin they use. The American Society for Testing and Materials, Philadelphia, PA, announced in June 1993 a modification to the existing Standard Specification for Pig Tin (B339). Now, tin users may specify a new level of tin purity called "Grade A Tin" for the manufacture of tinplate; this specification calls for a new, lower lead impurity level of 0.020 per cent maximum compared to 0.050 per cent maximum under the normal grade A specification. This change was in response to industry concerns, growing over the past year, about possible deleterious effects caused by lead in tinplate[13].

80. Supply changes to comply with a perceived need for higher tinplate purity have already occurred. A standard tin grade with 0.02 per cent, or 200 parts per million, of lead has been proposed by the USA and EC countries. This new grade, designated for tinplate is within the 98.85 per cent purity in tin standard and may require additional refining costs, of the order of US$100 per ton (in the long run).

81. In Thailand, the rising tide of environmentalism has affected mining in tourist areas and closed off Government forest areas for mining. In 1991, only 130 mines were operating, less than one-half the total before the 1985 "tin crisis". All 42 tin mines on the tourist island of Phuket were closed.

82. Tin smelters are also under scrutiny from environmental groups for example, Metales Potosi, the Mexican tin smelter has been reported as closed temporarily on environmental grounds[14]. These considerations are likely to continue to exert pressure not only on tin but all mining industries.

83. Environmental pressures have led a number of tin mining companies to include environmental control measures and costs in their investment and operating costs programmes, at all stages of processing. Some producers have already responded to this new demand by starting new production of low lead tin. For example, P.T. Tambang Timah, in Indonesia, has already exported some 60 metric tons to Japan and was expected to export some 300 metric tons to the latter and the USA by the end of 1994. Thaisarco, in Thailand is also said to have started a new brand of almost pure tin.

84. In summary one can say that environmental concerns and pressures are having increasing influence on consumer behaviour and consequently on the quality and

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[13] "Tin in May 1993", Mineral Industry Surveys, US Bureau of Mines.

[14] Ibid.

quantity of tin used and this trend is likely to gain in importance in the future. However, the impact on the tin industry, while somewhat increasing the cost of production, might have a positive impact on demand for pure tin especially in the solder industry.

VI. SHORT-TERM OUTLOOK

85. The image of tin as a high-priced raw material in decline has changed. The contribution of lower tin prices to the increase in tin consumption in the short term probably was relatively small, because it takes time to adjust inputs to a change in relative prices for other materials and through technological changes induced by the lower prices.

86. Worldwide, tin production lags behind consumption. The DLA stockpile has been reduced by almost 25,000 metric tons since 1990 and production cutbacks have taken place most notably in Malaysia. However, these relatively healthy fundamentals are offset by high stock levels, which still provide an impediment to market strength.

87. The chances of a consumer-led recovery seem negligible without the development of a major new tin application. Concentrate supply, however, could fall back rapidly as a result of accelerated mine closures because of low prices.

88. In Russia, given the fact that production is barely enough to cover local demand and the country was previously a net importer of tin, no further exports should be expected in the near future.

89. In view of the continuing overhang of tin stocks at significant levels, combined with persistent weak demand from industrialized countries as well as countries in Eastern Europe, slow growth in the volume of tin trade is expected in the short and medium term.

90. Expected increased world tinplate capacity is likely to continue to exceed world demand and consequently to have a dampening effect on tinplate prices. Taking into account the prevailing economic conditions, price and technological developments and environmental pressures, western world demand for tinplate is expected to decline slightly. However, this decline should be compensated by an increase in tinplate demand in developing countries. Therefore world tinplate demand is expected to remain stable.

91. In conclusion, one can say that with the recession in 1990 through 1993, world tin consumption turned downward. However, substitution of other materials for tin may be close to its limits and tin's remaining market share appears to be relatively secure. In the long term, tin is expected to increase slowly.

VII. INTERNATIONAL COOPERATION ON TIN

92. At the end of June 1989, the sixth International Tin Agreement (I.T.A.) expired effectively thus putting an end to the longest standing regulated commodity market. However, all operations of the I.T.C. had already ceased since June 1988 and the final settlement of all debts was completed at the end of March 1990.

93. Between October 1985 and June 1989, tin trading was suspended on the LME. In June 1989, tin quotations were reintroduced on the LME.

94. Following an initiative from the Association of Tin Producing Countries (A.T.P.C.), the terms of reference for the establishment of an International Tin Study Group (I.T.S.G.) were negotiated under the auspices of UNCTAD and adopted at a United Nations Conference in April 1989. So far, eleven countries (Belgium, France, Greece, Indonesia, Italy, Luxembourg, Malaysia, Netherlands, Nigeria, Portugal, Thailand) and the EEC have notified their provisional or definitive acceptance of the Terms of Reference, accounting together for 36.56 per cent of world trade in tin. The International Tin Study Group can enter into force if countries representing at least 70 per cent of world trade in tin notify their acceptance of the Terms of Reference. The UNCTAD secretariat had been requested to continue the statistical work previously undertaken by the International Tin Council and the UNCTAD Trust Fund on Tin Statistics until the entry=-into-force of the International Tin Study Group.

95. The statistical activities are now being undertaken by UNCTAD as part of its regular work and thirteen bulletins of International Tin Statistics have been issued so far.

96. In March 1987, the A.T.P.C. has initiated a Supply Rationalization Scheme (SRS) to be reviewed each year to ensure some stability in the market and to dispose of the huge overhanging stocks which existed in the aftermath of the October 1985 tin market collapse. Brazil and China, two non-ATPC members have also been cooperating in respecting the SRS provisions and annual export quotas, in order to limit supply and defend tin prices. In April 1994, China formally joined the Association of Tin Producing Countries (ATPC) and has agreed to meet a 1994 export quota of 20,000 metric tons under the Supply Rationalization Scheme (SRS) enforced by ATPC. Nevertheless, in view of the little effect the scheme seems to have on tin prices, the general sentiment amongst ATPC members, which seemed to emerge at their meeting in the course of 1993, was to re-examine the SRS in order to ensure its credibility and viability.

97. The International Tin Research Institute (ITRI) announced in December 1992 a widening of the scope of its tin research activity. Since its founding in 1932, the ITRI has limited its research activities for and funding sources to its producer sponsors. Now, the ITRI has established a new limited liability company called the International Tin Research Association. The facilities of ITRA will be open to commercial firms and to trade or research associations worldwide. At present, organizations subscribing to ITRA will have the opportunity to participate in cooperative research projects which are of mutual interest to a particular industrial sector, or to place specific research contracts with ITRA, with exclusive access to the results. Although ITRA will be a separate organization with its own subscribers and clients, it will be fully supported by all the facilities of ITRI, including technical expertise and support staff.

ANNEX

Table 1

Tin, Summary table 1989-1994

	1989	1990	1991	1992	1993	1994
Mine production (tin-in-concentrates, thousand tonnes)	239.9	222.5	187.5	177.7	189.3+	
Tin metal production (thousand tonnes)	241.2	240.2	210.3	186.7	202.3+	
Tin metal consumption (thousand tons)	257.3	252.2	237.0	221.9	224.8+	
DLA Disposal (tons)	2,775	2,145	6,195	8,815	6,022	4,240 a/
Reported stocks (tonnes):						
- L.M.E. b/	9,020	19,380	13,295	15,385	20,050	32,300 a/
- country stocks c/	20,000	18,000	18,700	11,100	10,700	10,100 a/
Strategic Stockpiles USA (tons)	171,200	168,500	163,000	153,900	144,700	139,500 d/
Average LME price US$/tonne e/	8,668	6,235	5,592	6,098	5,159	5,329 f/

* preliminary including estimates

a) As at end of September 1994
b) LME stocks as at end of year
c) Producers and consumers, at the end of the year
d) End-August 1994
e) Average for the year
f) Average first 9 months of 1994

Source: UNCTAD, the United States Bureau of Mines (DLA disposals), and World Metal Statistics (US strategic stockpiles).

Table 2

World Annual Mine and Primary Smelter Capacity by region and country, December 1991
(Metric tonnes)

Region/Country	Mine capacity	Smelter capacity
North America:	*300*	-
United States	300	-
Western Europe:	*13,000*	*38,000*
Germany	2,000	3,000
Netherlands	-	7,000
Portugal	6,000	2,000
Spain	-	14,000
United Kingdom	5,000	12,000
Others:	*13,000*	*7,000*
Australia	10,000	2,000
Japan	-	2,000
South Africa	3,000	3,000
Eastern Europe:	*20,300*	*20,300*
Czechoslovakia	300	300
Former USSR	20,000	20,000
Developing countries:	*211,100*	...
Africa	*12,400*	8,000
Cameroon	200	-
Namibia	1,500	-
Niger	300	-
Nigeria	2,000	3,000
Rwanda	2,000	2,000
Swaziland	100	-
Tanzania	100	-
Uganda	100	-
Zaire	4,000	1,000
Zambia	100	-
Zimbabwe	2,000	2,000
Asia:	*109,100*	*200,000*
Myanmar	2,000	1,000
Indonesia	35,000	32,000
Korea, Republic of	100	2,000
Laos	1,000	-
Malaysia	40,000	120,000
Thailand	30,000	44,000
Vietnam	1,000	1,000
America:	*89,600*	*90,000*
Argentina	1,000	1,000
Bolivia	20,000	32,000
Brazil	60,000	50,000
Mexico	600	7,000
Peru	8,000	-
Socialist counties of Asia:	*45,000*	*45,000*
China	45,000	45,000
Total	302,700	408,300

Source: "Tin 1991", James F. Carlin, Jr., US Bureau of Mines, November 1992.